

EX PARTE OR LATE FILED
DOCKET FILE COPY ORIGINAL
WILEY, REIN & FIELDING

1776 K STREET, N.W.
WASHINGTON, D. C. 20006
(202) 429-7000

ORIGINAL
RECEIVED

MAY 10 1994

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

FACSIMILE
(202) 429-7049

WRITER'S DIRECT DIAL NUMBER

May 10, 1994

(202) 429-7338

William F. Caton
Acting Secretary
Federal Communications Commission
Room 222
1919 M Street, N.W.
Washington D.C. 20054

Re: **Ex Parte Presentation in Gen Docket No. 90-314 (Amendment of the
Commission's Rules to Establish New Personal Communications Services)**

Dear Mr. Caton:

On May 9, 1994, Jerry Leonard, Terry Sterkel, and Ron Cross representing WINForum, met with several staff members of the Office of Engineering and Technology and the Office of Plans and Policies to discuss the spectrum allocation and technical standards for unlicensed PCS devices. In attendance at the two meetings were Tom Stanley, Phil Inglis, Dave Sidall, Rick Engleman, and Julius Knapp all of OET and Bob Pepper and Don Gipps of OPP. The representatives from WINForum reiterated their positions supporting the allocation of spectrum for unlicensed PCS devices and the adoption of the WINForum Spectrum Etiquette (subject to the recommended modifications as documented in WINForum's Petition for Reconsideration in this proceeding).

In addition, the attached documents were provided to the staff and should be associated with Gen. Docket No. 90-314. Please call me at (202) 429-7338 should you have any questions on this matter.

Sincerely,



Michael A. Lewis
Engineering Policy Advisor
Wiley, Rein & Fielding

Enclosures as stated

No. of Copies rec'd
List ABCDE

241

WIREFORUM

The User PCS Industry Association

RECEIVED

MAY 10 1994

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

The User PCS Vision . . .

. . . the Future, Today!

U.S. INFORUM The User PCS
Industry Association

Why User PCS?

- A “Home” for Emerging Technologies, e.g. Video, Data, and Audio. (National Competitiveness, Response to MITI)
- A “Home” for Small Business (SWMRs) (low capitalization, low market entry barriers)
- Unlicensed PCS proposed by FCC in 1990 to allow ease of purchase and use of Video, Data, and Audio Devices and Systems (No Licensing Procedures)
- 1.89 to 1.93 GHz allows for interoperability with Licensed PCS
- FCC and Industry Vision is for Customer-Owned Equipment with no user fees

Meeting the Challenge . . . WINForum

- The only U-PCS Consensus Body
- Since 1992
- > 30 manufacturers
 - ◆ Computer Companies
 - ◆ PBX Companies
 - ◆ LAN Companies
 - ◆ Software Companies
 - ◆ Related Disciplines (Bellcore/SRI Intl.)
- Recognized the Technical Challenge
(maximize applications, minimize interference, stimulate innovation)
- Chartered Technical Consensus Committee,
"WINTech"

U-PCS Applications

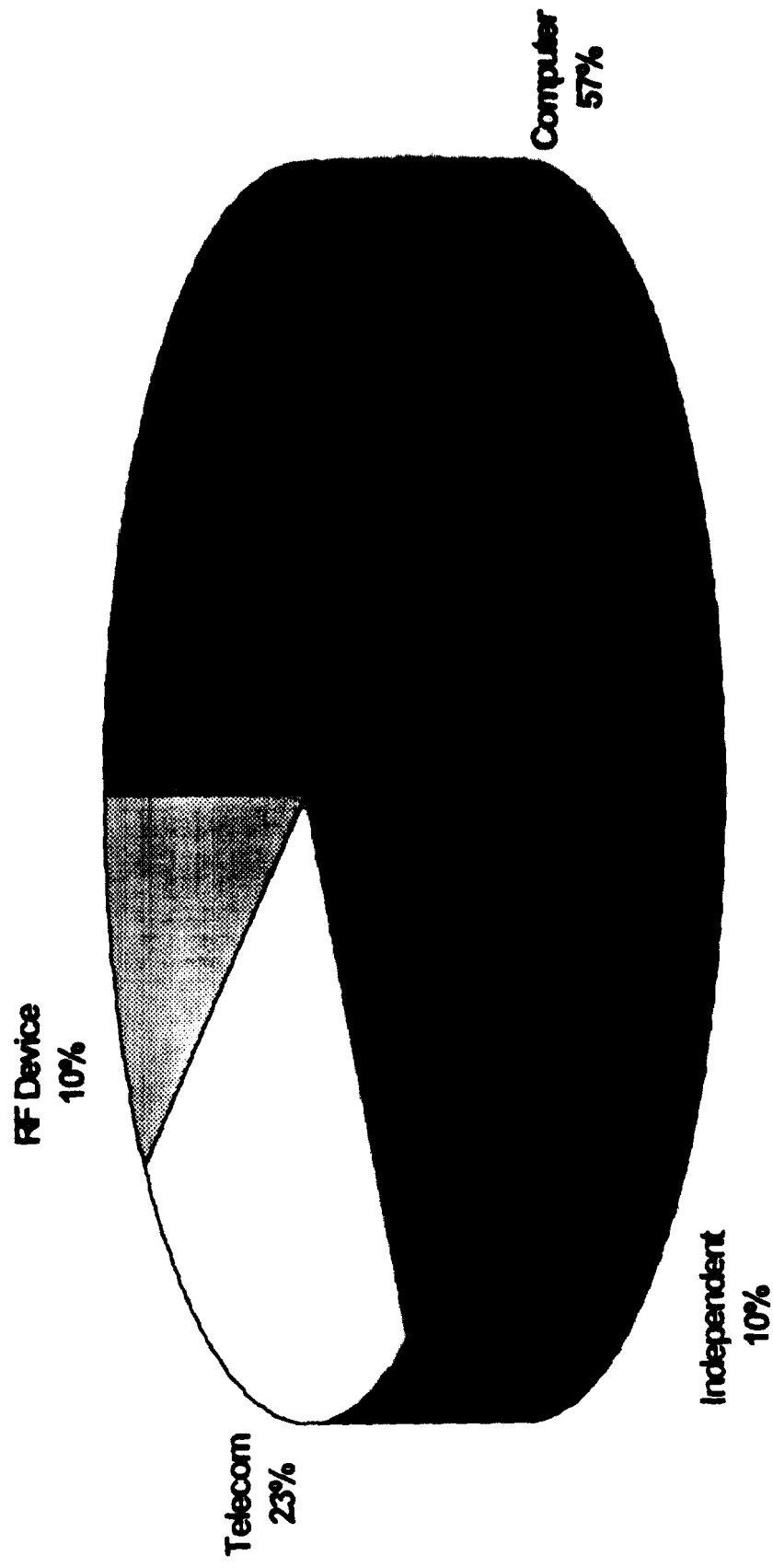
Isochronous

- **Advanced Cordless**
e.g. fax and/or voice
mail boxes
- **PDA**
e.g. Personal Teachers
- **Inter-Active Video**
e.g. Wall-less
Classroom

Asynchronous

- **Collaborative Workstations,**
e.g. Ad Hoc Work
Groups
- **Wireless LAN,**
e.g. Campus networks
"Data -PCS"

WINForum Membership



WINForum Membership

Computer H/W and S/W

AMD
Digital Equipment
Farallon Computing
GEC Plessey
HEWLETT - PACKARD
INTEL
IBM
MICROSOFT
National Semiconductor
NCR
ROCKWELL
SUN MICROSYSTEMS
Tandem
Tetherless Access
TRAVELING SOFTWARE
WiSE Communications
Windata
XIRCOM

Independent Orgs

BELLCORE
LACE COMMUNICATIONS
SRI INTERNATIONAL

RF Device

CALIFORNIA MICRO
PCSI

Telecom Equipment

AT&T
ERICSSON
MOTOROLA
NORTHERN TELECOM
OMNIPOINT
ROLM/SEIMENS
SPECTRALINK

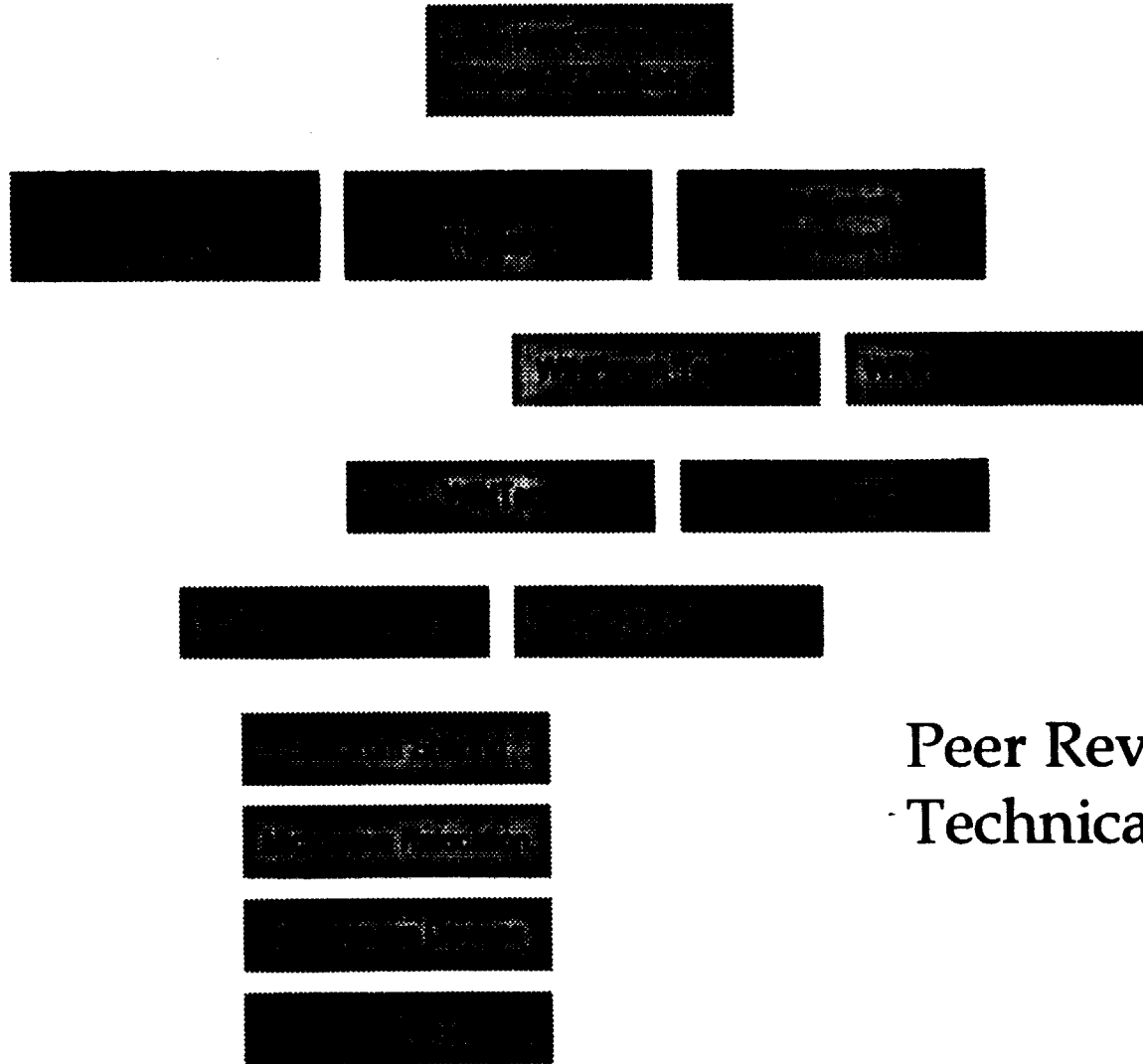
Note: Participant in Etiquette Definition

WINFORUM The User PCS
Industry Association

What are the Goals of U-PCS Spectrum Sharing?

- Maximize Technology and Applications Innovation
- Encourage Efficient Use of Resources
- Allow sharing by users of Video/Data/Audio
- Maximize geographical co-habitation of systems from various manufacturers
- Provide for deployment without Master Infrastructure (e.g. non-licensed)
- Allow for low cost implementation

WINForum Technical Process



Peer Review, and Technical Consensus

The Technical Process

- Contribution Driven
- Peer Review of Technical Merit
- Outside Contributions accepted
- Consensus Required
(2/3 vote on technical merits)
- 18 months, 24 meetings

Spectrum Sharing Etiquette Technical Papers

Technical Contributions by Topic

Simulations/Propagation/Generic	29
Spectrum Sharing	7
Isochronous Transmission	35
Asynchronous Transmission	11
Reports/Recommendations	37
Outside Input	11

(As of November 30, 1993)

Essential Elements of the WINForum Etiquette

- Detect energy on a *“Listen Before Talk”* Etiquette
- Acknowledge fundamental differences between Asynchronous and Isochronous Applications
 - ◆ Asynchronous uses quick access bursts
 - ◆ Isochronous uses continuous transmissions
- Bandwidth limited to 10 MHz for Asynchronous and 1.25 MHz for Isochronous
- Bandwidth/transmit power relationship to balance Signal vs. Interference

What Does the FCC Need to Do?

- Recognize importance of U-PCS to National Competitiveness/Small Business
- Maintain 40 MHz, as per current band plan
- *■ Ensure equal sharing of Spectrum, as isochronous and asynchronous applications are equally important , e.g.Video/Data/Audio
- Incorporate modifications to Part 15D to align with WINForum Spectrum Sharing Etiquette
- Recognize WINForum as the advocate and only consensus body for U-PCS

WINFOR!!!

The User PCS Industry Association



The User PCS Industry Association

WINForum Etiquette Rules Proposal

May 1, 1994

WINForum, as the only User PCS Industry Association, starting in July 1992, undertook the technical consensus process, to create a single set of Part 15 rules recommendations that combined the best available technology from companies who have identified themselves interested in User PCS applications, e.g. video, data, and audio.

WINForum has combined the relevant spectrum sharing (Etiquette) rules recommendations from its filings on June 21, 1993, September 7, 1993, and December 8, 1993. This document is the complete text of these recommended rules. It is provided to allow reference by FCC staff and other interested individuals to the full set of recommendations, without having to review the three WINForum Filings.

1.0

1.1 Transmitters in this band shall be used only for digitally modulated transmission, and shall be limited by power, frequency use, transmission time, and Spectrum access mechanism so as to provide fair access and coexistence for short range systems.

1.2 Definitions.

1.2.1 Isochronous Transmitters shall be defined as transmitters that emit at regular intervals, as typified by time-division voice systems.

1.2.2 Asynchronous Transmitters shall be defined as transmitters that emit at irregular intervals, as typified by Local Area Network (LAN) data systems.

1.2.3 Transmit Power.

The transmit power "P" is the maximum of the mean radiated power over any interval of continuous transmission.

1.2.4 Measurements.

All power measurements will be made over an interval of continuous transmission. The measurement results shall be properly adjusted for any instrumentation limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true power measurement for the emission in question over the full bandwidth of the emission. The measurement bandwidth will be equal to the emission bandwidth.



The User PCS Industry Association

WINForum Etiquette Rules Proposal

May 1, 1994

1.2.5 Marker Transmission.

A marker transmission is a low-capacity, predominately one-way transmission used by a device to identify itself to other inter-operable devices within its communication range. The content and purpose of marker transmissions shall be limited to minimal control and signaling information as needed by a device to establish or maintain communications with other inter-operable device.

1.2.6 Occupied Bandwidth

Occupied bandwidth is that bandwidth that contains 99% of the total transmit power, including allowance for frequency instability and spurious emissions.

1.2.7 Sub-Bands

The available band shall be divided into two equal sub-bands; one sub-band for isochronous operation and one sub-band for asynchronous operation. The Isochronous sub-band shall be the 1890 - 1900 and 1920 - 1930 MHz spectrum. The Asynchronous sub-band shall be the 1900 - 1920 MHz.

2.0 Transmit Power Limits

2.1 Maximum Transmit Power

2.1.1 The transmit power "P" shall not exceed
 $100 * \sqrt{B}$ milliwatts

where "B" = occupied bandwidth in MHz.

2.1.2 Further, the transmit power shall not exceed 3 milliwatts in any 3-KHz wide band.

2.1.3 Power -- Bandwidth Example Table

<u>Power in mW</u>	<u>Bandwidth in MHz</u>
32	0.1
52	0.3
100	1.0
173	3.0
316	10.0

2.1.4 The peak envelope power shall not exceed the transmit power by more than 10 dB.

2.2 Reduction with Antenna Gain



The User PCS Industry Association

WINForum Etiquette Rules Proposal

May 1, 1994

The permitted transmit power shall be reduced by the amount in dB that the maximum directional gain of the antenna exceeds 3 dBi.

2.3 Emission Limits

This section applies to all emissions not within the occupied bandwidth regardless of cause and includes spurious emissions. The measurement bandwidth will be the equal to the occupied bandwidth. The emission limits are specified relative to a reference power which is the lesser of the maximum transmit power for the occupied bandwidth as given in section 2.1 or 113 milliwatts.

2.3.1 Inter-1.25 MHz Frequency Segment Emissions

The total power, emitted by an intentional radiator operating in a 1.25 MHz frequency segment, detected in the immediately adjacent 1.25 MHz segment, shall be at least 30 dB below the power permitted that radiator.

The total power emitted by an intentional radiator in the band between 1.25 MHz and 2.5 MHz measured from the edge of the occupied segment, shall be at least 50 dB below the transmit power permitted for that radiator.

The total power emitted by an intentional radiator in any frequency segment more than 2.5 MHz from the edge of the occupied bandwidth, shall be at least 60 dB below the transmit power permitted for that radiator.

2.3.2 Out of Sub-band Emissions.

The total power emitted by an intentional radiator, in the third and subsequent 1.25 MHz frequency segments beyond the sub-band edge, shall be at least 60 dB below the transmit power permitted an intentional radiator operating with an 1.25 MHz occupied bandwidth.

2.3.2.1 Within the PCS band (licensed and unlicensed).

The total power emitted by an intentional radiator in the first 1.25 MHz frequency segment beyond the sub-band edge, shall be at least 30 dB below the transmit power permitted an intentional radiator operating with an 1.25 MHz occupied bandwidth.

The total power emitted by an intentional radiator, in the second 1.25 MHz frequency segment beyond the sub-band edge, shall be at least 50 dB below the transmit power permitted an intentional radiator operating with an 1.25 MHz occupied bandwidth.



The User PCS Industry Association

WINForum Etiquette Rules Proposal

May 1, 1994

2.3.2.2 Outside of the PCS band (licensed and unlicensed).

The less stringent of the limits of 2.3.2.1 or CFR 47.15.209 applies.

2.3.3 Out-of-Occupied Bandwidth Emissions for Isochronous Transmissions

The total power emitted by an intentional radiator in the band between 1 B and 2 B measured from the center of the occupied bandwidth, shall be at least 30 dB below the transmit power permitted for that radiator.

The total power emitted by an intentional radiator in the band between 2 B and 3 B measured from the center of the occupied bandwidth, shall be at least 50 dB below the transmit power permitted for that radiator.

The total power emitted by an intentional radiator in the measurement bandwidth more than 3 B from the center of the occupied bandwidth, shall be at least 60 dB below the transmit power permitted for that radiator.

3.0 Frequency Limits

3.1 Asynchronous Bandwidth Limits

The occupied bandwidth shall be between 500 kHz and 10 MHz.

All devices of less than 2.5 MHz occupied bandwidth in the asynchronous sub-band will occupy the spectrum nearest the sub-band edges or exactly at the band centers, before otherwise occupying further spectrum in the center half of the sub-band, while devices of more than 2.5 MHz occupied bandwidth will occupy spectrum in the center half of the sub-band before occupying the spectrum nearer the sub-band edges. Devices of occupied bandwidth of less than 1.0 MHz may not occupy the center half of the sub-band unless they are nominally centered in the middle of their sub-band.

3.2 Isochronous Occupied Bandwidth Limits

The Isochronous sub-band shall be divided into segments 1.25 MHz in width. Isochronous frequency Segments are 1.25 MHz apart, beginning at the lower edge of the frequency band of the unlicensed PCS Band. No occupied bandwidth greater than 1.25 MHz is permitted in this sub-band; narrower bandwidths are permitted within each 1.25 MHz segment.

3.3 Isochronous Occupied Bandwidth Limits

In the Isochronous sub-band, the occupied bandwidth shall be between 50 kHz and 1.25 MHz.



The User PCS Industry Association

WINForum Etiquette Rules Proposal

May 1, 1994

3.4 Spectrum Sharing

Cross-over between sub-bands will be governed by adherence to the rules of the sub-band entered.

3.5 Frequency Stability

In the Asynchronous Sub-band: the frequency stability of the intentional radiator shall be equal to or better than ± 10 PPM over 10 milliseconds or the interval between Listen Before Transmit monitorings, whichever is shorter

In the Isochronous Sub-band: the frequency stability of the intentional radiator shall be equal to or better than ± 10 PPM over 1 hour or the interval between Listen Before Transmit monitorings, whichever is shorter

4.0 Time Limits

4.1 Isochronous Frame Period

The frame period of an Isochronous transmitter shall be 10 milliseconds/N where N is a positive integer.

Devices operating in the Isochronous sub-band that implement time division for the purposes of maintaining a duplex connection on an occupied bandwidth shall maintain their frame repetition rate with frequency stability of at least 50 PPM. Devices which further divide access in time in order to support multiple communication links on an occupied bandwidth shall maintain their frame repetition rate with frequency stability of at least 10 PPM. The jitter introduced at the two ends of such a communication link shall not exceed 25 microseconds for any two consecutive transmissions.

4.2 Asynchronous Transmission Bursts

4.2.1 An asynchronous transmission burst is a series of transmissions from one or more transmitters acting cooperatively. Any intra-burst gap shall not be greater than 25 microseconds. No burst duration shall be greater than 10 milliseconds.

4.2.2 Individual bursts shall be separated by at least a random-duration interval uniformly distributed between 50 microseconds and 375 microseconds.

4.3 Unacknowledged marker transmissions from a device shall be limited to 30 seconds. After that period the spectrum access procedure shall be required to initiate further marker transmissions.

5.0 Spectrum Access



The User PCS Industry Association

WINForum Etiquette Rules Proposal

May 1, 1994

5.1 Spectrum Access in the Isochronous Sub-band

- 5.1.1 Before initiating transmission, devices shall have monitored the intended occupied bandwidth within the portion(s) of the Isochronous frame(s) in which they intend to transmit over the period of at least 10 milliseconds to determine if the access criteria are met.
- 5.1.2 An initiating device may attempt to establish a duplex connection by monitoring both its intended transmit and receive time and spectrum windows. Time and spectrum window access selection for the initiating device shall be based on the higher measured power of the intended transmit or receive time and spectrum windows. If the power detected by the responding device can be decoded as a duplex connection signal from an interoperable device (the initiating device), then the responding device may immediately begin transmitting on the receive time and spectrum window of the initiating device.
- 5.1.3 Before initiating transmission, devices which are in a state which prevents them from monitoring during their intended transmit interval shall monitor the portion(s) of the Isochronous frame(s) in which they intend to receive over a period of at least 10 milliseconds to determine if the access criteria are met so long as the monitored spectrum is within the 1.25 MHz frequency segment(s) already occupied by that device or co-located (within one meter) co-operating group of devices. The receive monitoring interval must total a least 50% of the 10 millisecond interval.
- 5.1.4 Neither section 5.1.2 nor 5.1.3 shall be used create a "bypass" procedure whereby devices may extend the range of spectrum occupied over space or time for the purpose of denying fair access to spectrum to other devices.
- 5.1.5 Succeeding transmissions may be sent without further monitoring, as long as the occupied bandwidth is entirely within the Isochronous sub-band.
- 5.1.6 With the exception of marker transmissions, all access attempts initiated after following the procedure in section 5.1.1 must stop after one second if no acknowledgment has been received by the initiating device. Further access attempts must repeat the procedure outlined in section 5.1.1.

5.2 Spectrum Access in the Asynchronous Sub-band

- 5.2.1 Before each burst is transmitted, devices shall monitor the intended occupied bandwidth. The monitoring period shall be at least 50 microseconds.

WINFORUM

The User PCS Industry Association

WINForum Etiquette Rules Proposal

May 1, 1994

- 5.2.2 Once a burst has started, participating transmitters are not required to monitor the occupied bandwidth, providing the gap between transmissions does not exceed the intra-burst gap 4.2.3.

5.3 Spectrum Access Criteria and Selection

- 5.3.1 If monitoring required in paragraphs 5.1 or 5.2 indicates that the particular occupied bandwidth selected is in use, transmission may not proceed; there are two possible spectrum access alternatives.
 - 5.3.1.1 Another intended occupied bandwidth may be selected and monitored.
 - 5.3.1.2 After the occupied bandwidth becomes idle, the transmitter shall wait a deference time chosen from a uniform random distribution between X and $15X$, where $X = 10$ ms for Isochronous devices; $x = 50$ microseconds for asynchronous devices. At the end of this period, the transmitter may again proceed according to the appropriate rule 5.1 or 5.2.
- 5.3.2 For asynchronous devices, The range from which the deference time is chosen shall double on each occasion that an access attempt fails (after the inter-burst interval), until an upper limit of $240X$ is reached. The range shall be reinitialized after each successful access attempt.
- 5.3.3 Each device shall implement a spectrum access mechanism adequate to prevent catastrophic congestion.
- 5.4 Monitoring Requirements
 - 5.4.1 The monitoring mechanism shall operate via the transmitting antenna, or one that includes the coverage area of the transmitting antenna.
 - 5.4.2 Monitoring Threshold
 - 5.4.2.1 Isochronous Monitoring Threshold

A device detecting energy below 30 dB above the thermal noise power in the intended occupied bandwidth for a selected time/frequency combination may access it without further searching.



The User PCS Industry Association

WINForum Etiquette Rules Proposal

May 1, 1994

If no "free" time/frequency combination is available, and at least 40 duplex system access time/frequency combinations are defined for the system, the time/frequency combination with the lowest power below a monitoring threshold of 50 dB above the thermal noise power in the intended occupied bandwidth may be used. A device utilizing this mechanism must have monitored all access intended time/frequency combinations within the last 10 seconds and must verify within the 20 milliseconds immediately preceding spectrum access that the detected power of the time/frequency combination selected is no higher than the previously detected value. The resolution for power measurements need not be more accurate than 6 dB.

No device or group of cooperating devices within 1 meter of each other shall occupy more than three 1.25 MHz Isochronous frequency segments during any frame.

5.4.2.2 Asynchronous Monitoring Threshold.

The threshold shall be within 32 dB of the thermal noise power in the intended occupied bandwidth.

5.4.3 Maximum Reaction Time

The maximum reaction time of the monitoring system will be less than $50 \times \text{SQRT}(1.25/B)$ microseconds for signals at the applicable threshold level (5.4.2) but shall not be required to be less than 50 microseconds. For a signal that is 6 dB or more above the applicable threshold level. The maximum reaction time shall be $35 \times \text{SQRT}(1.25/B)$ microseconds but shall not be required to be less than 35 microseconds.

"B" is defined as Occupied Bandwidth in MHz.

5.4.4 The threshold decision shall be made based on the maximum power detected during the monitoring interval.

5.4.5 Every transmitter shall discontinue transmission in case of either absence of information to transmit or failure.

5.5 Dynamic Power Control and Monitoring Sensitivity

Transmitters that radiate power that is lower than the maximum specified in section 2 may increase their detection threshold by one dB for each one dB that the transmitter power is below the maximum permitted.